REMARKS

In the final Action, claims 1, 2, 4-6, 9-12, 14-17, 19, 20 and 26 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,191,410 to Johnson ("Johnson") in view of U.S. Patent No. 5,446,290 to Fujieda et al. ("Fujieda"). The Examiner stated that Johnson discloses all elements of the invention as claimed except for a flat light guiding plate having parallel opposed main faces. The Examiner cited Fujieda as disclosing the use of a flat light guiding plate 13 having parallel opposed main faces in a fingerprint reading device (citing col. 4, lines 39-43). In view of this disclosure, the Examiner has taken the position that it would have been obvious to replace the light guiding plate disclosed by Johnson with the flat light guiding plate with parallel opposed main faces as disclosed by Fujieda because such arrangement is advantageous in that the amount of light and color can be controlled. Claims 3, 7, 8 and 21-25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Johnson in view of Fujieda, and further in view of U.S. Patent No. 5,869,701 to Young ("Young"). Young was cited as disclosing the use of a matrix type LCD display having transparent electrodes driven by thin film transistors in a fingerprint reading device.

Applicants respectfully traverse the foregoing prior art grounds of rejection.

As recited by independent device claims 1 and 11, the inventive fingerprint reading device comprises a liquid crystal cell, an illumination source for projecting a light from the rear surface to the front surface of the liquid crystal cell, a flat light guiding plate having parallel opposed main faces disposed on the front surface of the liquid crystal cell for transmitting the light projected from the rear surface of the liquid crystal cell and deflecting light entering from the front surface toward a side end surface of the light guiding plate, light receiving means on the side end surface of the light guiding plate for receiving the deflected light exiting from the side end surface of the light guiding plate, and a drive circuit for driving the liquid crystal cell to pinpoint-irradiate a fingerprint in contact with the light guiding plate by pinpointing with the light emitted from the illumination source and causing the light receiving means to pinpoint-receive the light reflected by the fingerprint to thereby obtain an image of the fingerprint. Independent method claim 11 includes similar language.

Accordingly, each of independent claims 1, 6 and 11 requires a flat light guiding plate having parallel opposed main surfaces disposed on a front surface of a liquid

crystal cell. The light guiding plate performs two functions: (1) transmitting light projected from the rear surface of the liquid crystal cell; and (2) deflecting light entering from the front surface toward a side end surface of the light guiding plate so that such light may be received by light receiving means provided on the side end surface of the light guiding plate.

In the embodiment illustrated in Figs. 1(a) and 1(b) of the application drawings, the fingerprint reading device 10 has a light guiding plate 12 comprised of a flat plate having parallel opposed main surfaces disposed above the front or viewing surface of an active matrix liquid crystal cell 11. A light receiving device 13 is mounted flush with an end surface of the light guiding plate 12, and an illumination source 14 is disposed on or below the rear surface of the liquid crystal cell 11.

The light guiding plate 12 transmits light emitted from the illumination device 14 toward the front surface side but does not transmit the light coming from the front surface side toward the rear surface side. Instead, the light guiding plate 12 deflects or guides this light in a plane-direction toward the light receiving device 13 at one side end surface. The light receiving device 13 is constructed of a lens array 15 and a light receiving element 16 such as a photodiode.

The inventive fingerprint reading device can detect a fingerprint comparatively easily by use of an active matrix liquid crystal cell 11 and the light guiding plate 12. Further, the fingerprint reading device 10 has a structure similar to that of a liquid crystal display device and can be relatively simply manufactured at a low cost. The fingerprint reading device 10 can also be easily incorporated together with a liquid crystal panel into an electronic apparatus.

In accordance with the present invention, an image of a fingerprint can be read by use of an active matrix liquid crystal cell and a light guiding plate and the device may be easily incorporated into a liquid crystal display device.

The prior art of record fails to disclose or suggest the use of a flat light guiding plate.

Johnson discloses a fingerprint reading device having a light guiding member disposed on a liquid crystal matrix. As acknowledged by the Examiner, the light guiding member is a wedge-shaped prism and is not a flat light guiding plate having parallel opposing surfaces as recited by independent claims 1, 6 and 11.

The various drawbacks associated with the use of a prism in a fingerprint reading device as disclosed by Johnson include the increased thickness of the device caused by the prism, the increased cost of the device, and uneven resolution caused by the prism.

More specifically, a fingerprint read by the Johnson device will be partly out of focus and thus unreadable. Since light spreads as it travels, uneven distances are traveled by light in the prism. Thus results in distortion in reading the fingerprint because the distance traveled by light differs in different portions of the fingerprint being read by the Johnson device due to use of the prism.

Contrastingly, the inventive fingerprint reading device ensures that light travels uniformly through the flat light guiding plate so that the resolution of a read fingerprint device does not depend upon which portion of the fingerprint is being read.

Fujieda does not cure the foregoing defect. Fujieda was cited as disclosing the use of a flat light guiding plate 13 having parallel opposed main faces in a fingerprint reading device. However, as disclosed at col. 4, lines 39-43 of Fujieda, the optical plate 13 of Fujieda does not satisfy the limitations of independent claims 1, 6 and 11.

As noted above, claims 1, 6 and 11 recite a flat light guiding plate having parallel opposed main faces disposed over a front surface of the liquid crystal cell for:

(1) transmitting light projected from the rear surface of the liquid crystal cell; and

(2) deflecting light entering from the front surface toward a side end surface of the light guiding plate.

Fujieda discloses a fingerprint reading device comprised of a two-dimensional LCD matrix used as an image sensor 12, an optical element 13 for defining optical paths, and a planar light source 11 on which the sensor 12 and the optical element are provided. The upper face of the optical element 13 serves as a contact surface for a finger.

While the optical element 13 of Fujieda is flat and has parallel opposing surfaces, the optical element does not perform the functions recited by independent claims 1, 6 and 11.

In particular, Fujieda discloses that the optical element 13 defines the optical paths in a purely vertical direction and does not deflect light entering from the front surface toward a side end surface of the light guiding plate as required by claims 1, 6 and 11. In fact, the optical element 13 of Fujieda is not capable of performing the claimed function.

More specifically, the optical element 13 of Fujieda is constructed so that light may be focused on the finger contact area along the center lines between openings 28 and photo-sensitive elements 24 of the LCD matrix 12. In one embodiment of the optical element 13 shown in Fig. 7 of

Fujieda, it can readily be seen that light emitted from the planar light source 11 passes vertically through a transparent substrate 21 and the optical element 13, and is applied obliquely onto a finger placed in contact with the optical element 13. Light reflected from an interface between the finger and the optical element 13 reaches the photo-sensitive element 24 by passing vertically through routes different from the optical paths of the incident light, as seen from Fig. 7. The light shielding plates 23 prevent the light from the planar light source 11 from being directly applied to the photosensitive element 24.

However, the use of light paths such as fiber optic elements in the optical element 13 of Fujieda maintain purely vertical light paths which differ for light entering the device and light projected toward the fingertip. However, all light that passes through the optical element 13 of Fujieda does so in a vertical direction. The optical element is incapable of deflecting light that enters a main surface of the device toward a side end surface as required by claims 1, 6 and 11.

A rejection based upon obviousness under 35 U.S.C. §103(a) must establish the obviousness of each limitation of a rejected claim. In the context of a purportedly obvious modification, "the mere fact that the prior art may be

modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). For the reasons stated above, Fujieda does not suggest modifying Johnson to provide a flat light guiding plate that deflects light entering from the front surface thereof toward a side end surface of the light guiding plate. In fact, the optical element 13 of Fujieda is not capable of achieving this function.

Thus, it cannot be seen how Fujieda would have suggested modifying Johnson to utilize a flat light guiding plate having opposing parallel surfaces for deflecting light entering from the front surface thereof toward a side end surface of the light guiding plate.

Young does not cure the foregoing defects and does not suggest modifying Johnson to provide a flat light guiding plate having parallel opposed main faces. Young discloses a touch sensitive input device comprised of a plurality of individually operable touch-sensitive elements having first and second overlapping and spaced conductive layers 12, 15 with the second conductive layer being displaceable towards the first conductive layer in response to a touch input.

For the foregoing reasons, applicants respectfully submit that independent claims 1, 6 and 11 patentably

distinguish over Johnson taken in combination with Fujieda and Young. For the same reasons, dependent claims 2-10, 12, 14-17 and 19-26 are allowable over the prior art of record. Thus, applicants respectfully submit that the claim rejections under 35 U.S.C. §103(a) should be withdrawn.

In view of the foregoing, the application is now believed to be in condition for allowance. Accordingly, entry of the present amendment together with favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: _____
Bruce L. Adams
Reg. No. 25,386

50 Broadway - 31st Floor
New York, NY 10004
(212) 809-3700

MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: MS AF, COMMISSIONER FOR PATENTS, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

Debra Buonincontri
Name

Debra Buonincontri
Signature

February 28, 2004
Date